



Australian Government
Geoscience Australia

STRUCTURAL AND STRATIGRAPHIC ARCHITECTURE OF AUSTRALIA'S FRONTIER ONSHORE SEDIMENTARY BASINS: THE ARCKARINGA, OFFICER, AMADEUS, AND GEORGINA BASINS

L.K. Carr¹, R.J. Korsch¹, W.V. Preiss², S. A. Menpes²,
J. Holzschuh¹ and R.D. Costelloe¹.

¹Geoscience Australia, ²Primary Industries and Resources South Australia (PIRSA)



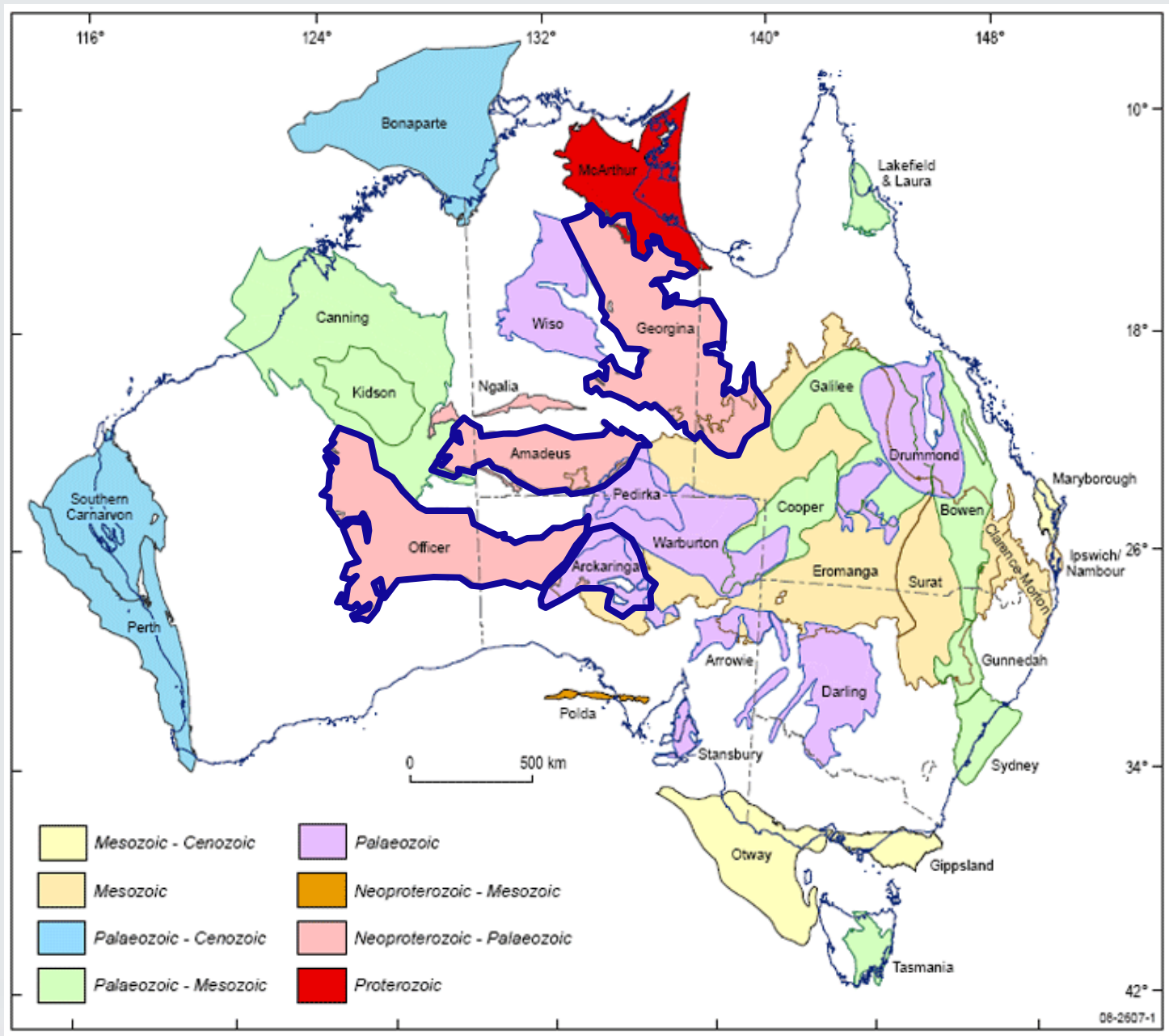
Government of South Australia
Primary Industries and Resources SA



Northern Territory Government

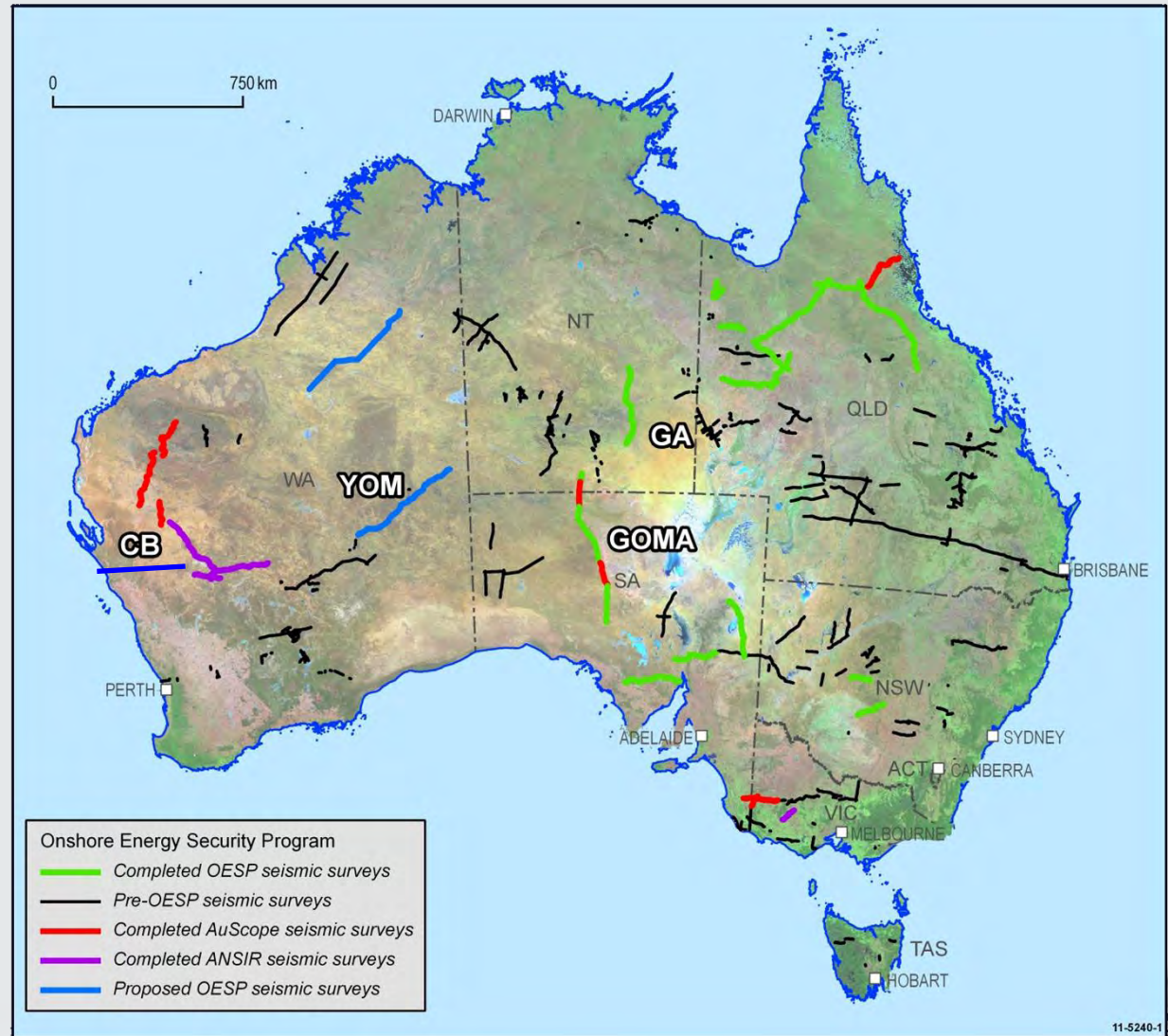


AuScope

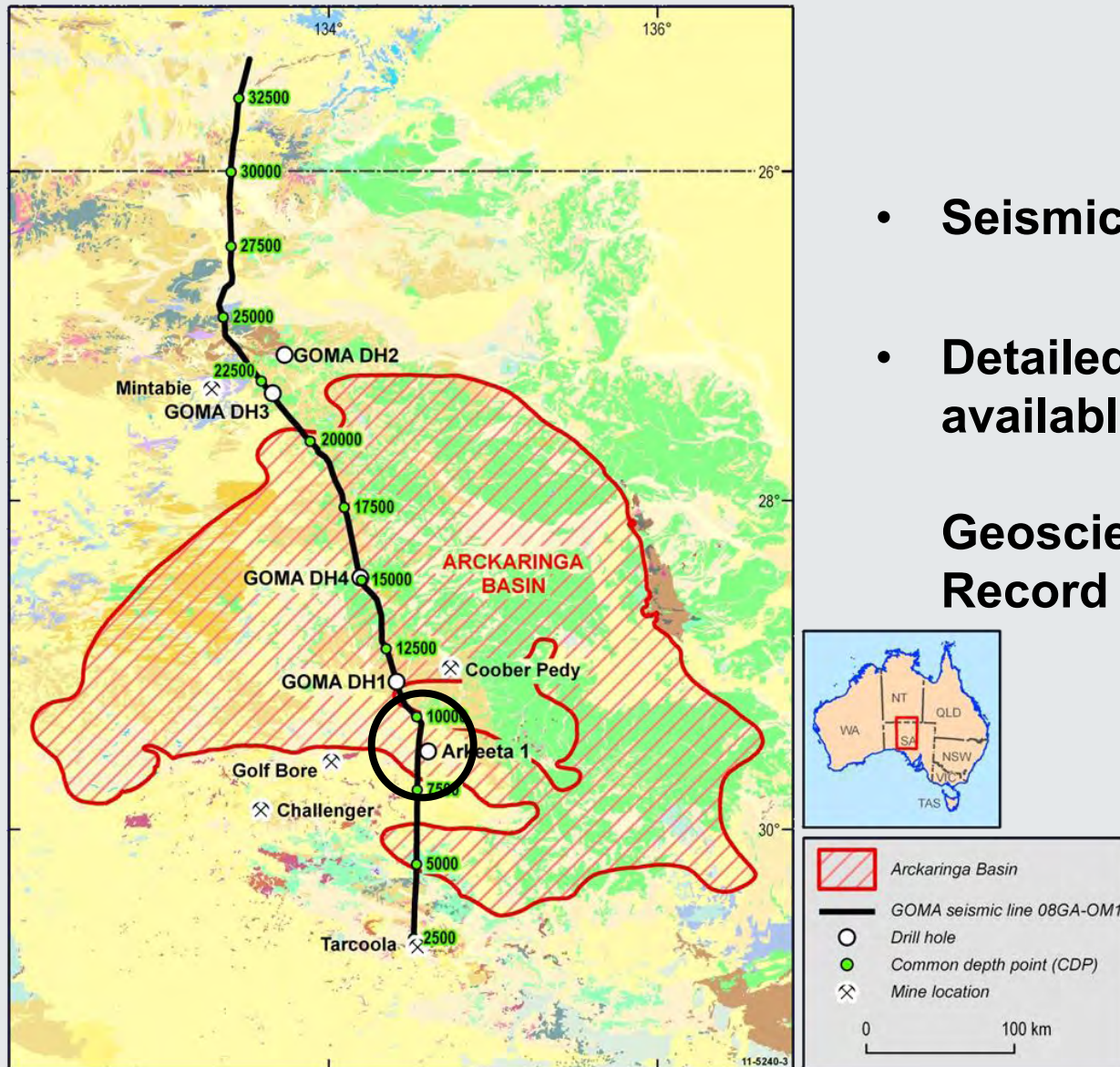


Onshore Energy Security Program

- 5 year program established in 2006
- Precompetitive geoscience data and assessments on petroleum, geothermal & uranium
- New deep seismic reflection data across frontier basins to document basin architecture, internal geometries
- Assess resource potential



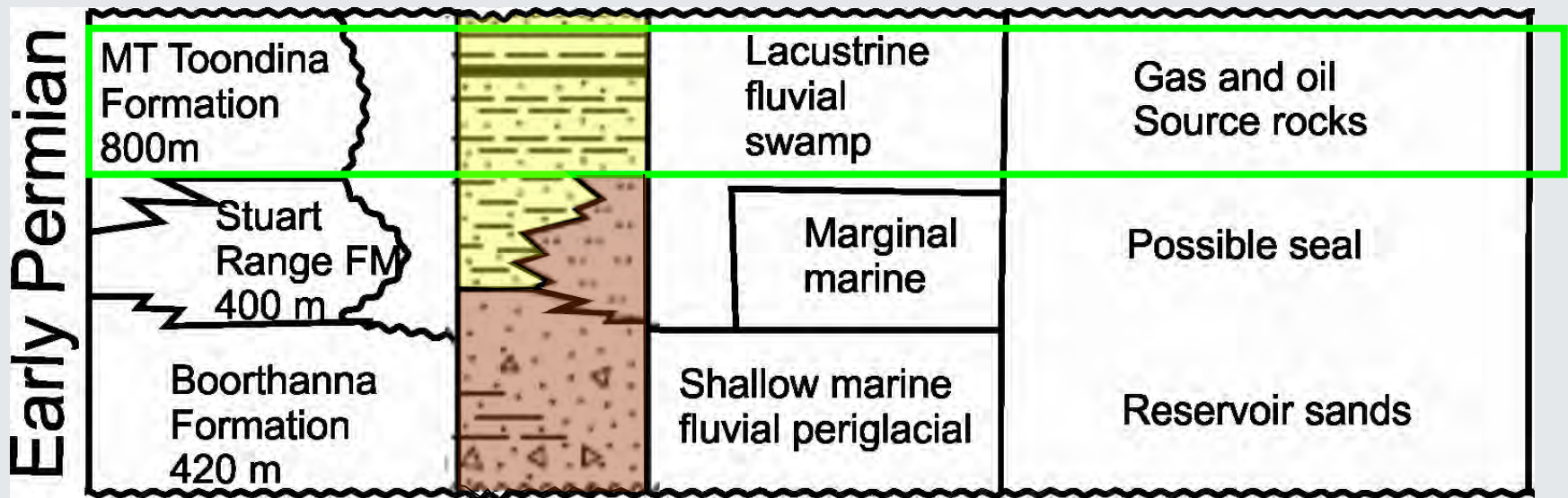
Arckaringa Basin



- Seismic line 08GA-OM1
- Detailed interpretation available in:

**Geoscience Australia
Record 2010/39**

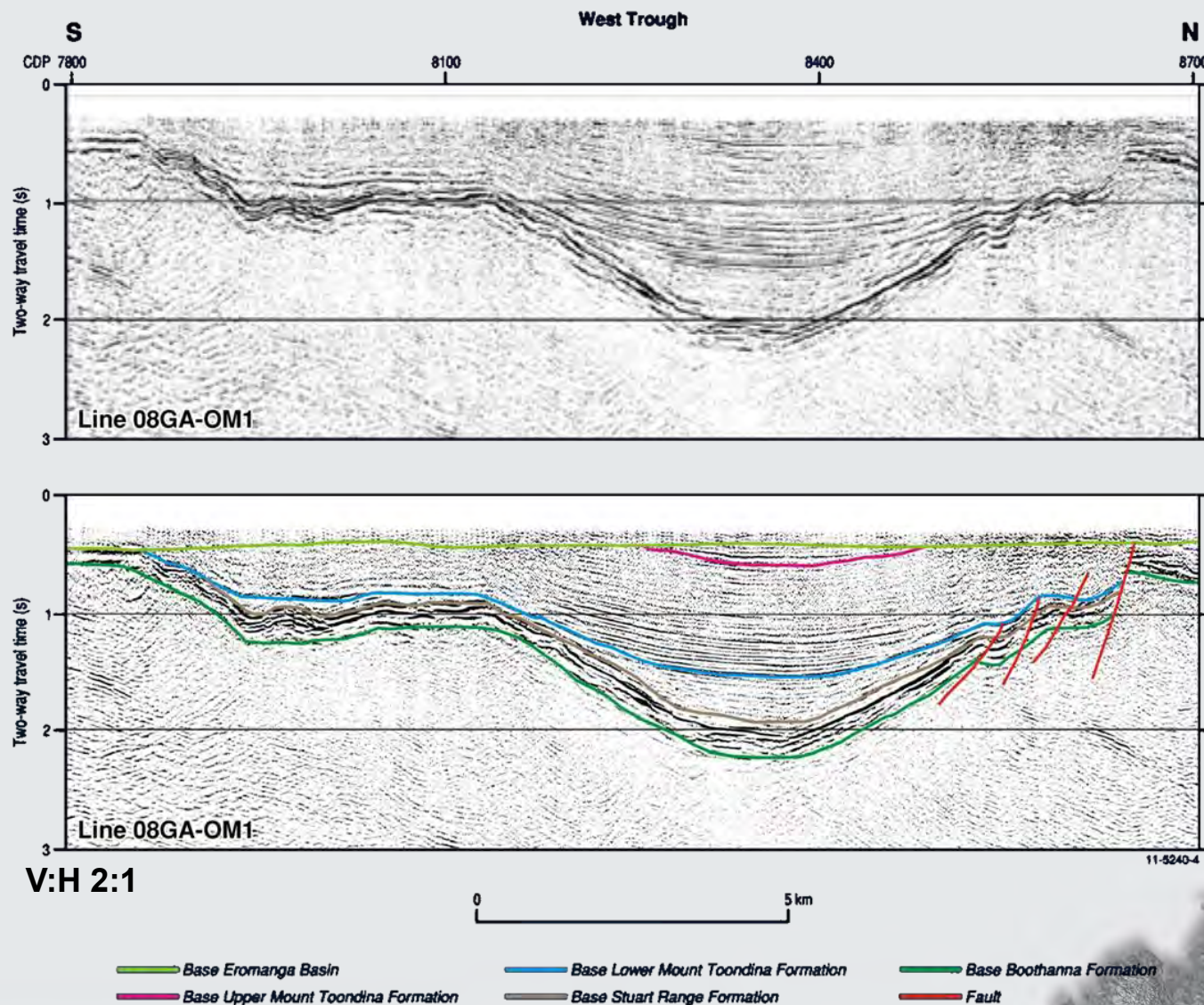
Arckaringa Basin – Permian Stratigraphy



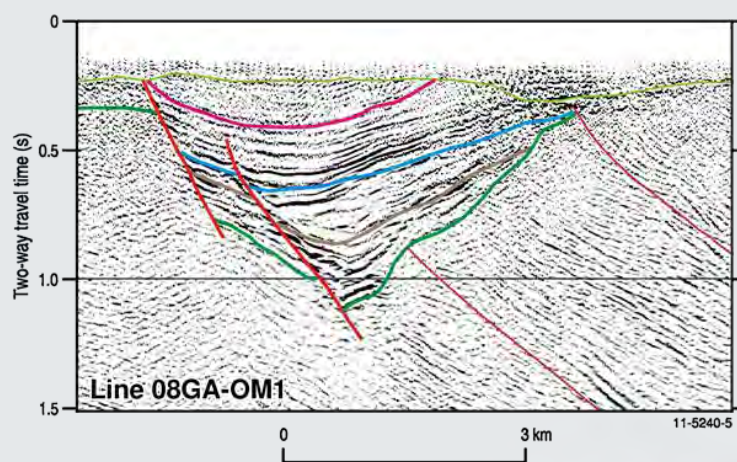
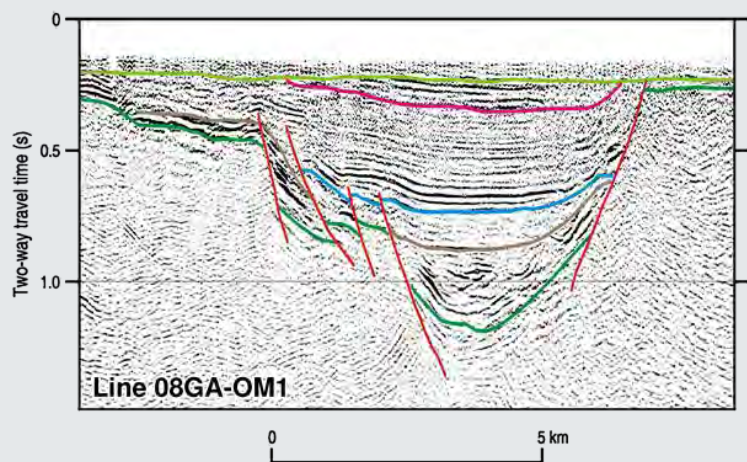
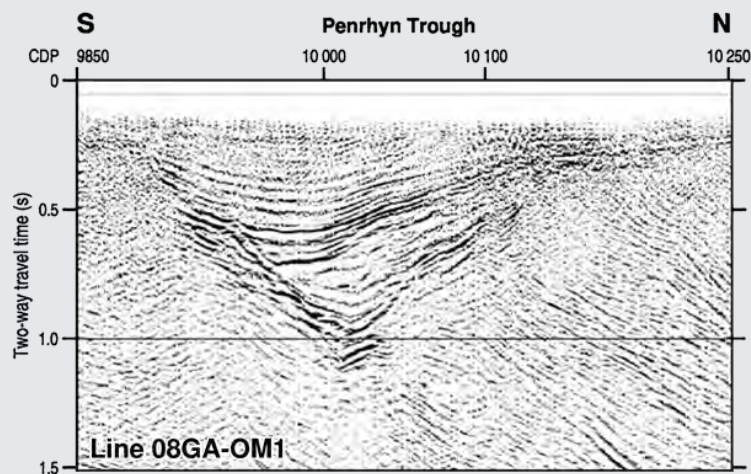
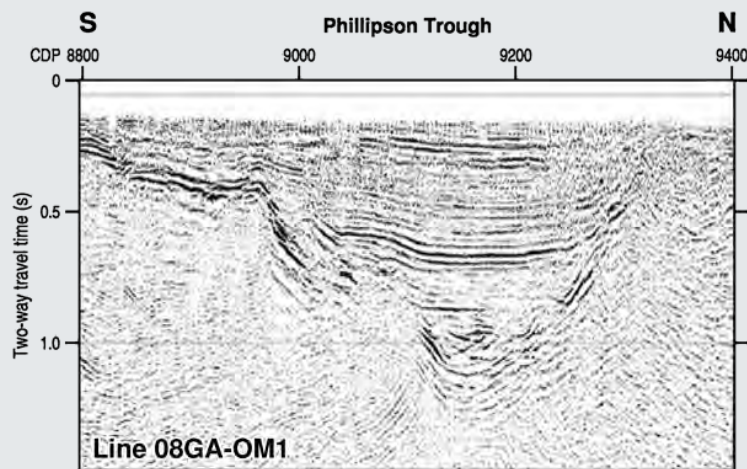
- Permian coal and hydrocarbon system

After Pirsa: http://www.pir.sa.gov.au/__data/assets/pdf_file/0006/26907/prospectivity_arckaringa.pdf

Arckaringa Basin – West Trough



Arckaringa Basin

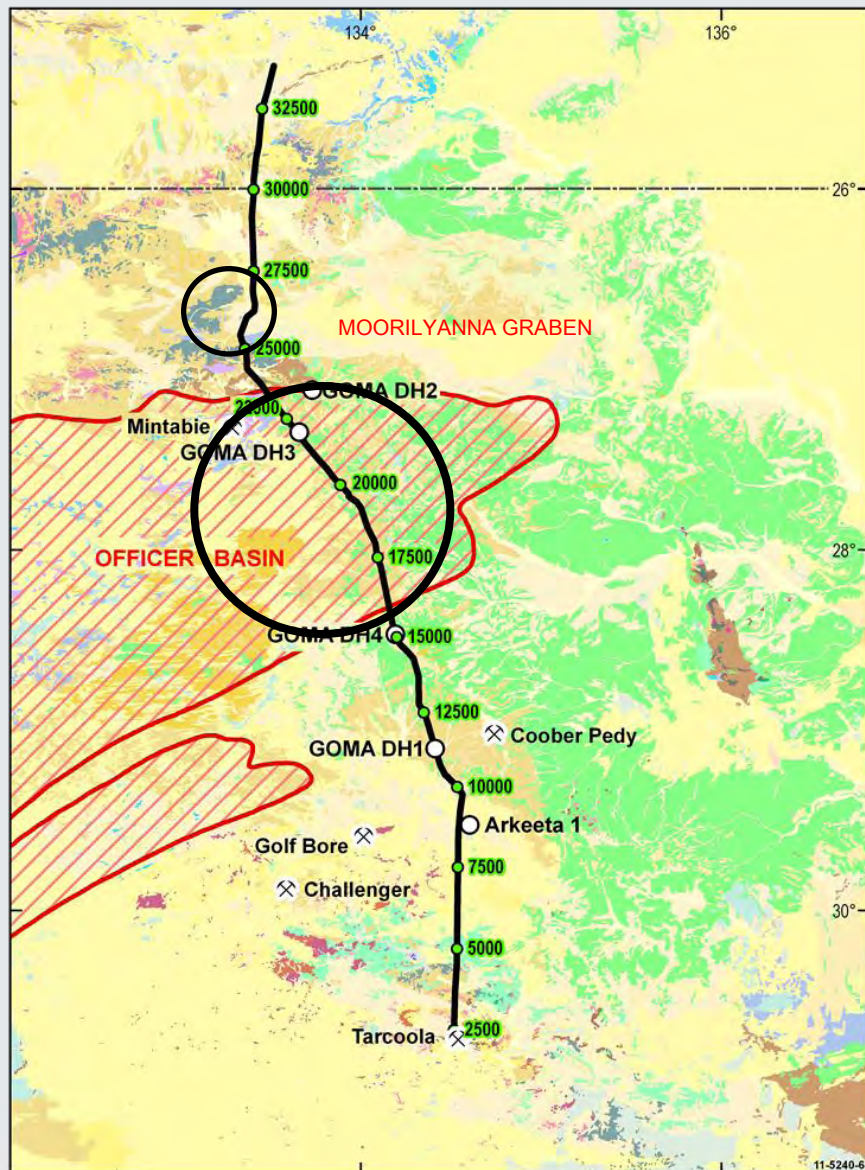


— Base Eromanga Basin
— Base Upper Mount Toondina Formation

— Base Lower Mount Toondina Formation
— Base Stuart Range Formation

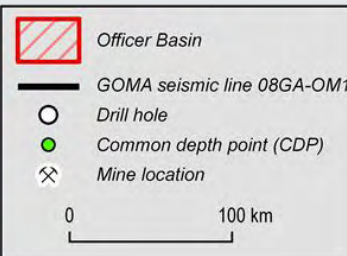
— Base Boothanna Formation
— Fault

Officer Basin

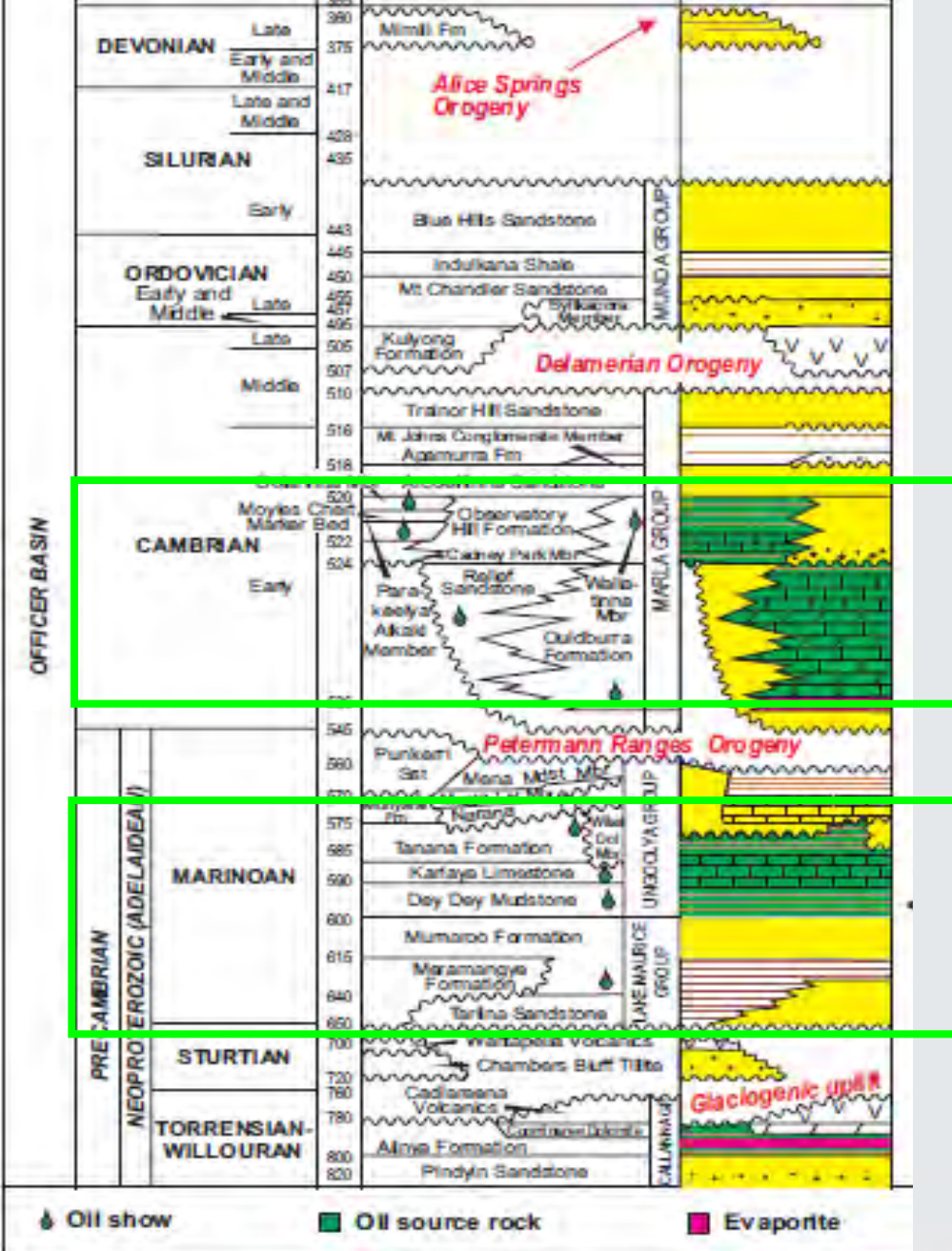


- Seismic line 08GA-OM1
- Officer Basin
- Moorilyanna Graben
- Detailed interpretation available in

**Geoscience Australia Record
2010/39**



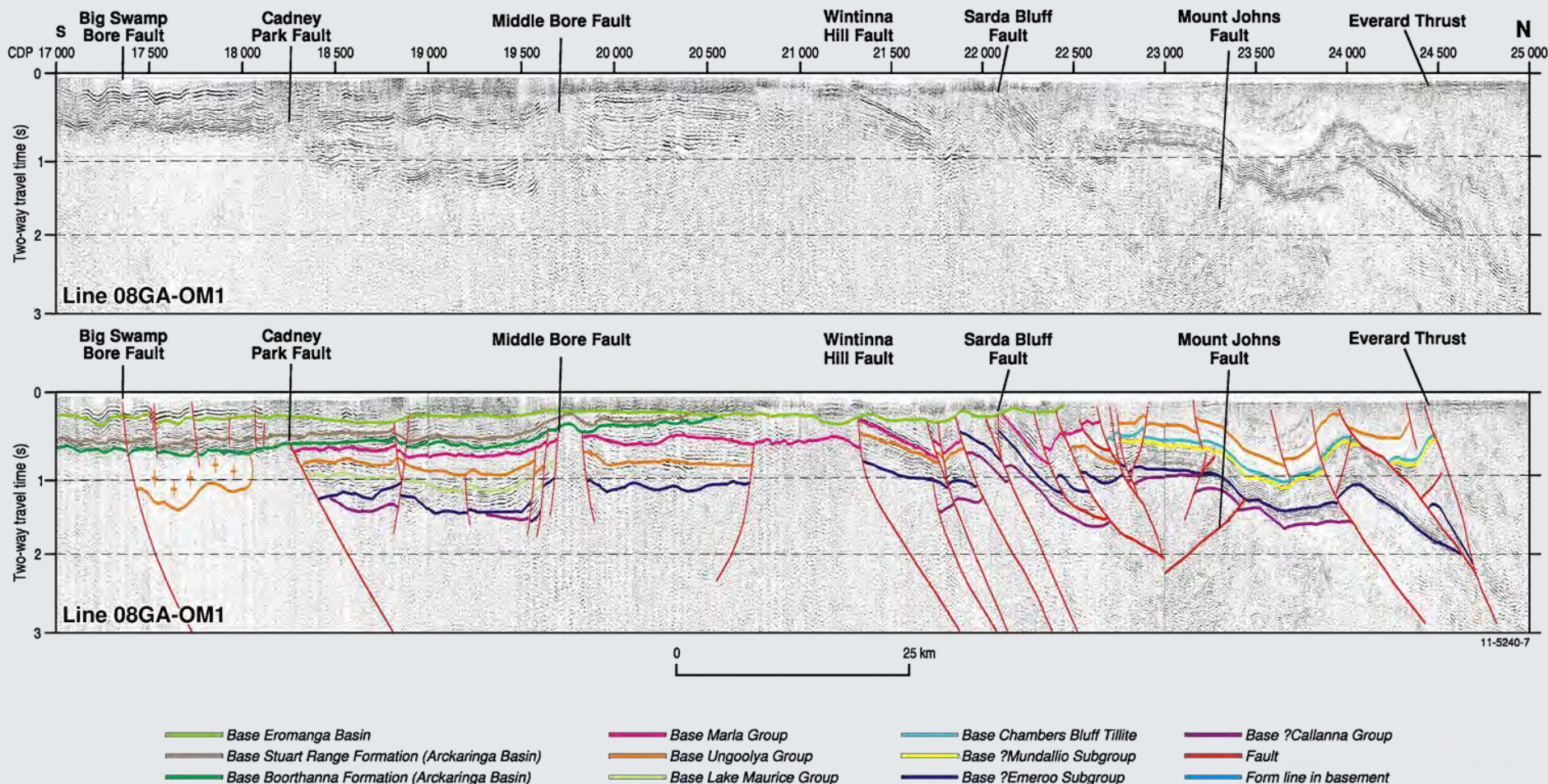
Officer Basin - Stratigraphy



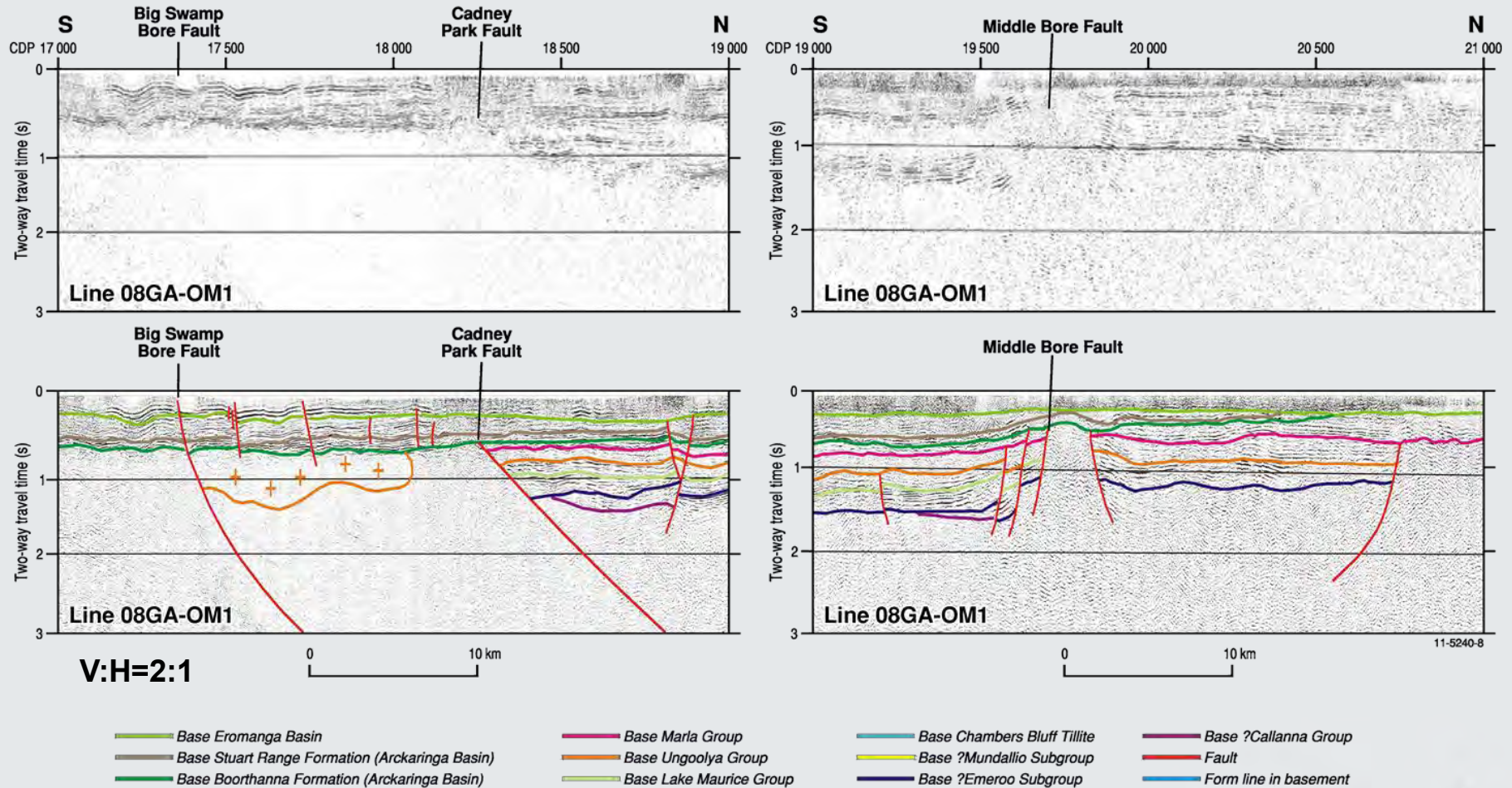
- 2 Cambrian hydrocarbon systems
- 2 Neoproterozoic hydrocarbon systems

http://www.pir.sa.gov.au/__data/assets/pdf_file/0019/26911/prospectivity_office_r.pdf

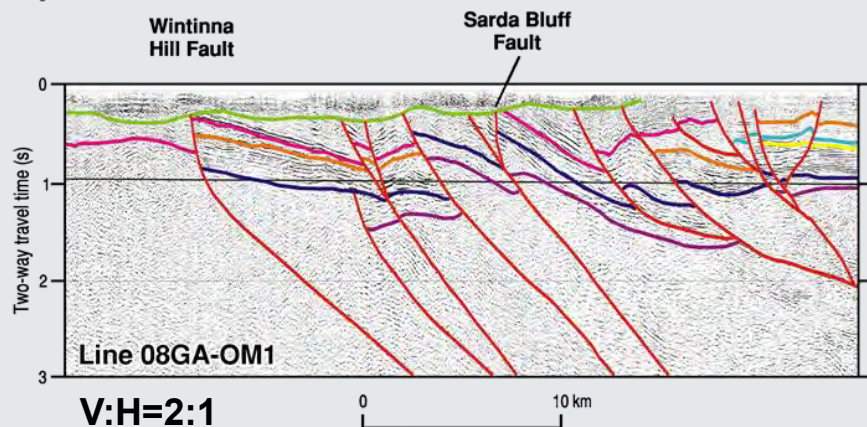
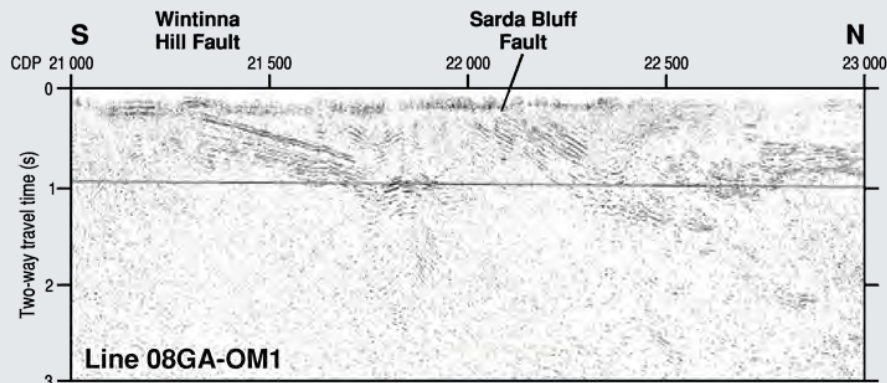
Officer Basin full line



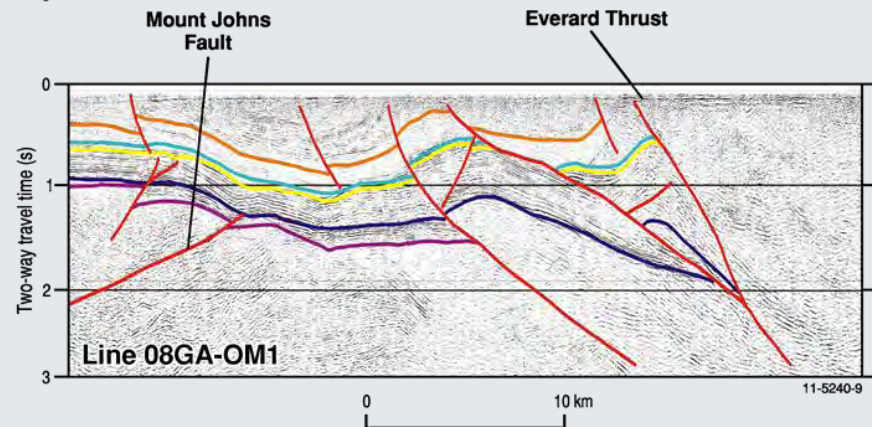
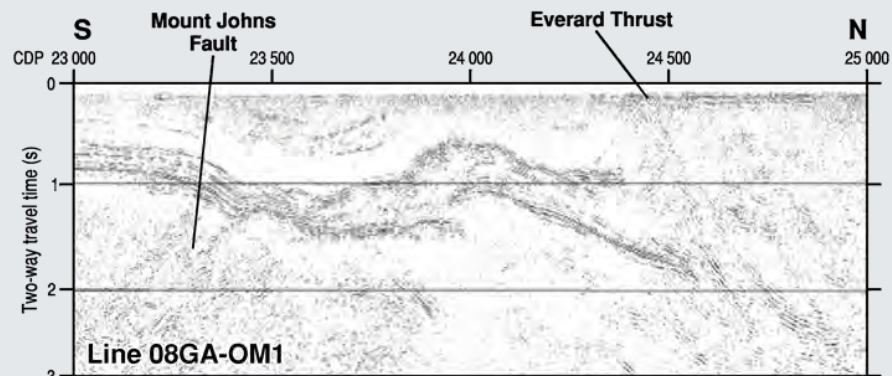
Officer Basin – Southern Section



Officer Basin – Northern Section

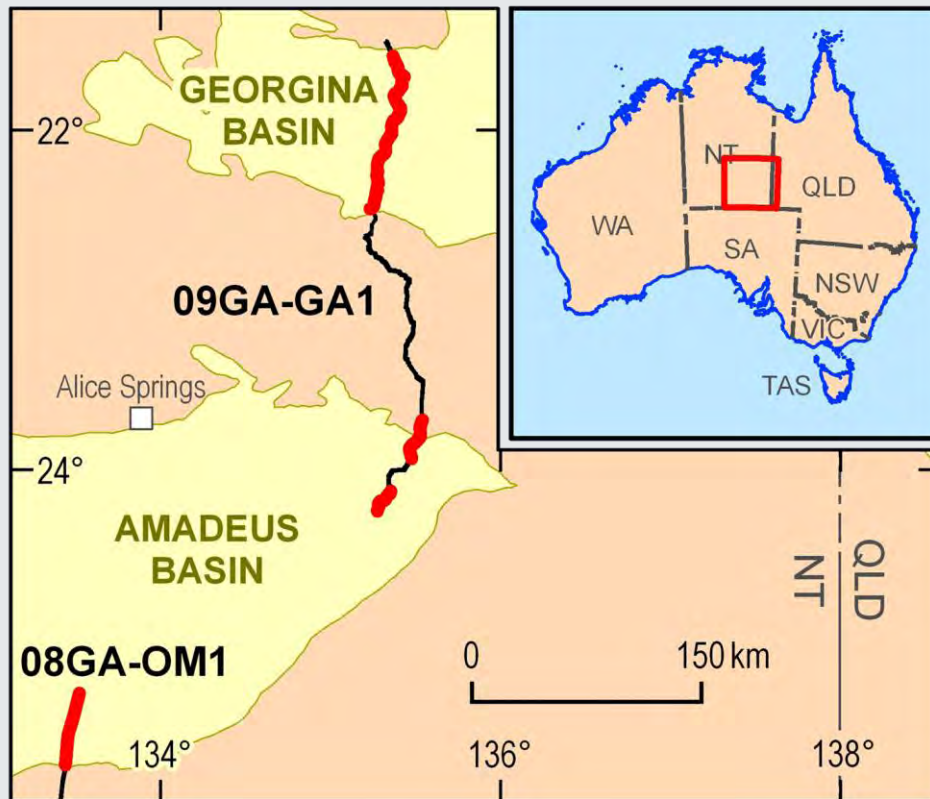


- Base Eromanga Basin
- Base Stuart Range Formation (Arckaringa Basin)
- Base Boorthanna Formation (Arckaringa Basin)
- Base Marla Group
- Base Ungoolya Group
- Base Lake Maurice Group



- Base Chambers Bluff Tillite
- Base ?Mundallio Subgroup
- Base ?Emeroo Subgroup
- Base ?Callanna Group
- Fault
- Form line in basement

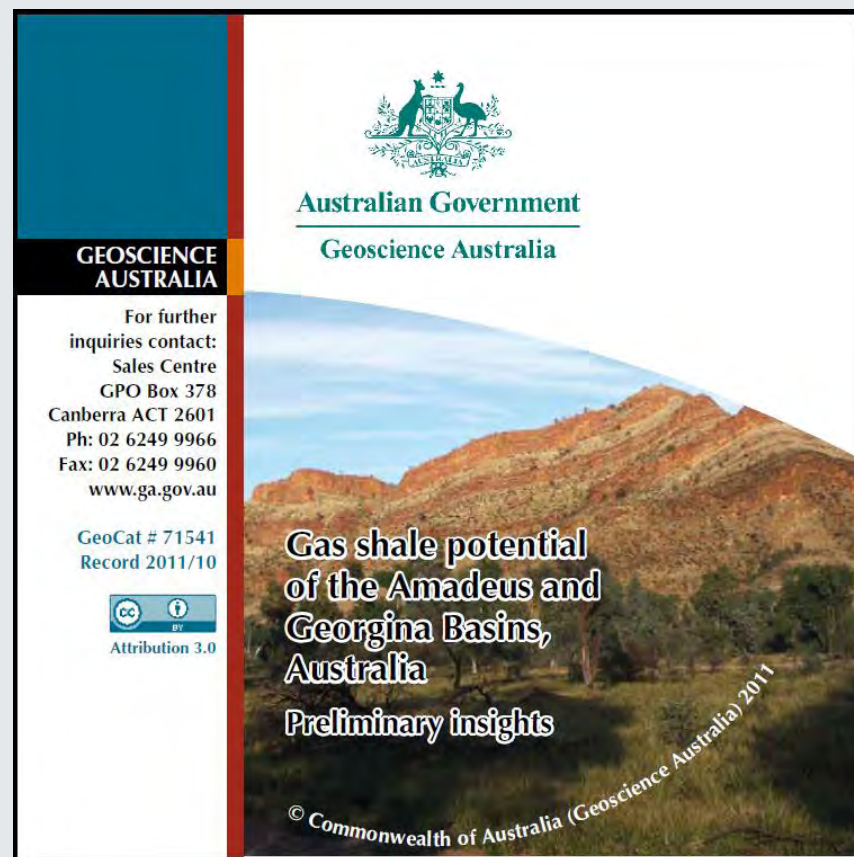
Amadeus and Georgina Basins



- Amadeus Basin Imaged on two seismic lines
- Shale gas study

Results of Preliminary Shale Gas Analysis

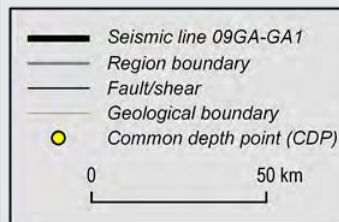
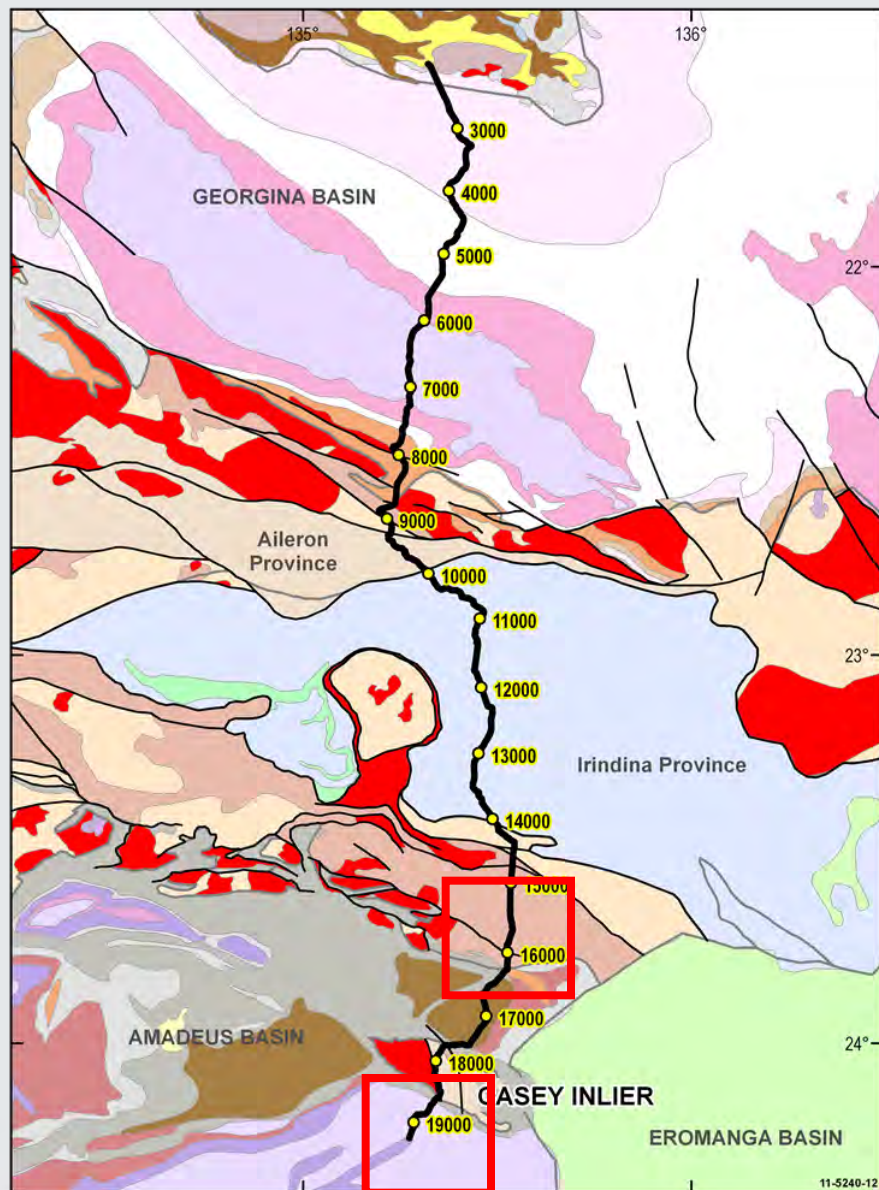
- Amadeus Basin: TOC = 3.16-3.42% (HVSlt) and HI =62-353 mg/g TOC
- Georgina Basin: TOC = 9.04-15.8% (Mid C Shale) and HI=~600mg/g TOC
- Both basins have high potential for gas shale
- **Geoscience Australia Record 2011/10 (available at booth)**



<http://www.ga.gov.au/energy>

Amadeus Basin

- 09GA-GA1 (Georgina-Arunta) seismic line; two sections
- 08GA-OM1 (GOMA) seismic line
- Neoproterozoic to Devonian
- Oil and gas producing basin
- Exploration from 1950s

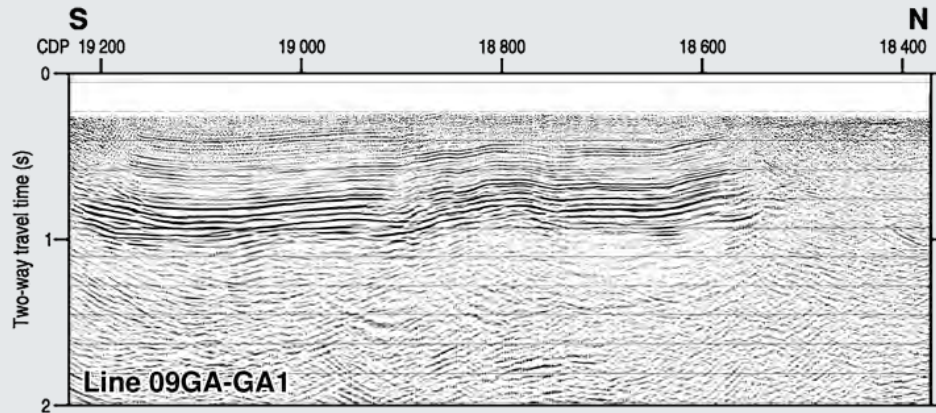


Amadeus Basin - Stratigraphy

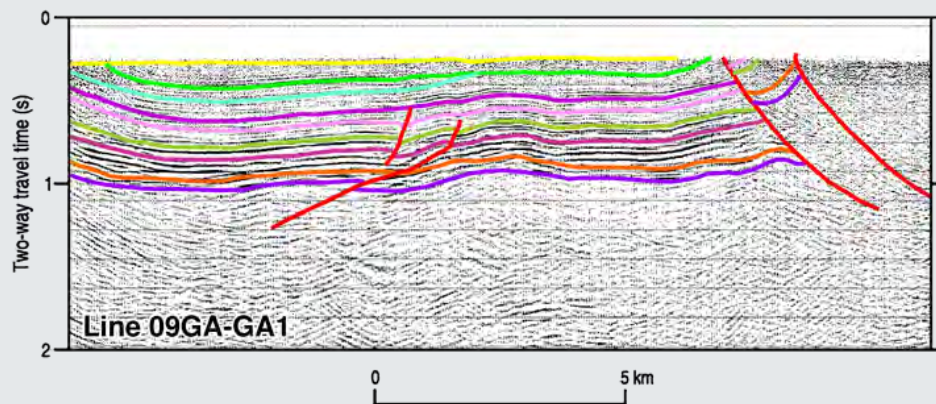
AGE		SOUTH - CENTRAL	NORTHEAST	TECTONIC EVENT	OIL & GAS
CARBONIF.					
DEVONIAN	EARLY	BREWER		Brewer Movement	
	MIDDLE LATE	PARKE	HERMANNSBURG PARKE		
SILURIAN		MEREENIE		Pertnara Movement	
ORDOVICIAN	LATE	CARMICHAEL		Rodingan Movement	<ul style="list-style-type: none"> Tent Hill, Ordanilla - 2 Tempe Vale, Mt Winter Mereenie, East Jonnys Cr Tempe Vale, Mt Winter Meerinie Palm Valley, W. Walker, Tent Hill Alice
	MIDDLE	STOKES			
	EARLY	STAIRWAY HORN VALLEY PACOOTA	PACOOTA	Pacoota Movement	
	LATE	GOYDER		Bloodwood Movement(?) (=Delamerian Orogeny)	
CAMBRIAN	MIDDLE	CLELAND	HUGH RIVER SHANNON	Giles Creek Movement	<ul style="list-style-type: none"> Wallaby, Orange - 1 Alice Orange - 1 Dingo - 1, BMR RD - 1A Wallaby
	EARLY		CHANDLER TODD RIVER	Chandler Movement	
			ARUMBERA	Petermann	
				Orogeny	
NEO PROTEROZOIC	NEO PROTEROZOIC III	WINNALL	JULIE	Souths Range Movement	<ul style="list-style-type: none"> Dingo - 1 and 2
			PENTATATAKA	Olympic Movement	
			OLYMPIC		
NEO PROTEROZOIC	CRYOGENIAN	ININDIA	AREYONGA	Areoyonga Movement	<ul style="list-style-type: none"> Ooraminna Finke, Mt Winter Mt Charlotte BMR AS - 3 Magee 1
BASEMENT		MUSGRAVE BLOCK	ARUNTA BLOCK	Source Rock	

Source: Beck L, 2002. The Amadeus Basin, Northern Territory Australia. Northern Territory Geological Survey, Record 2002-002.

Amadeus Basin - South of Casey Inlier



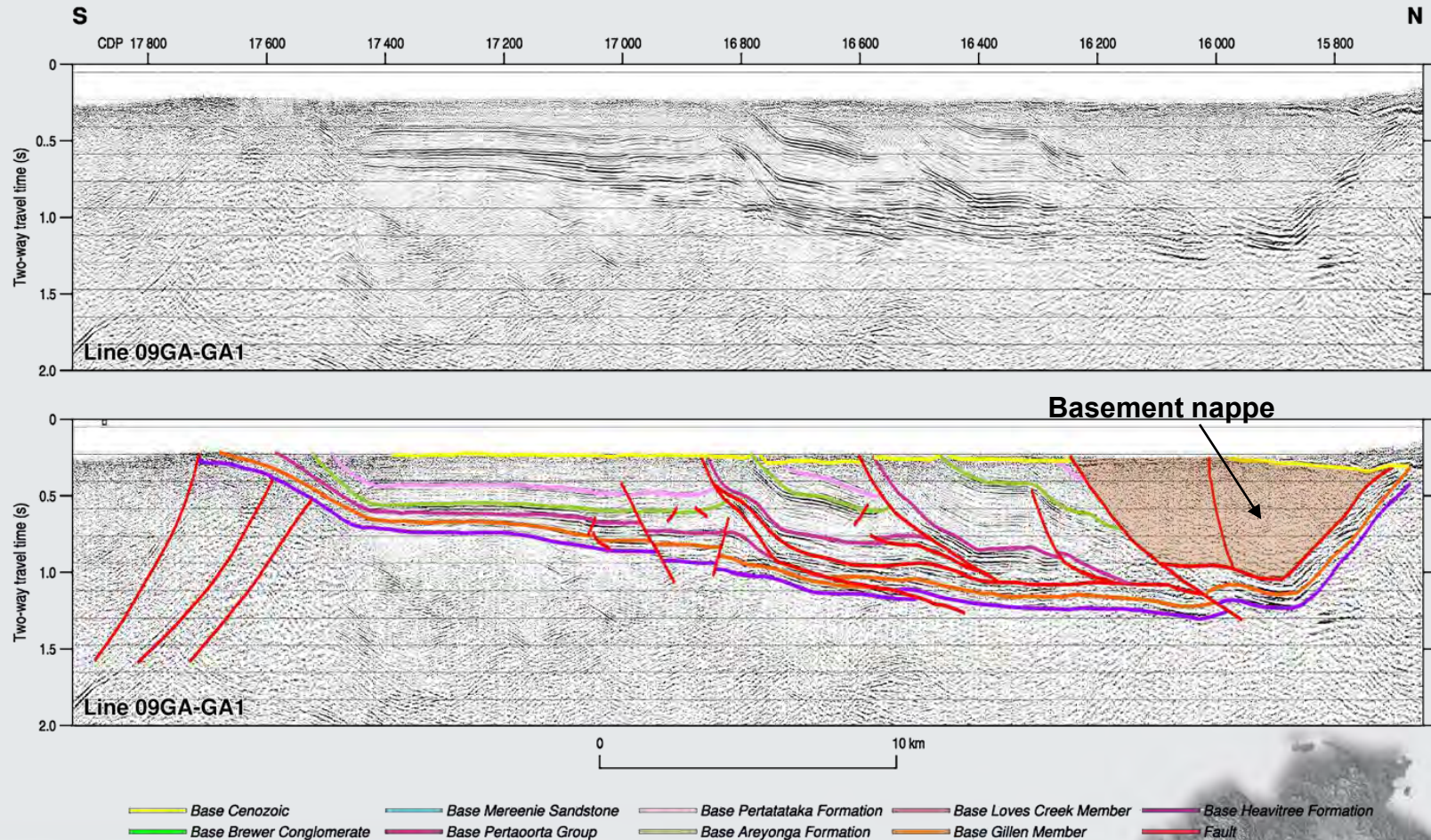
Flat lying sediments
with no growth –
strike section?



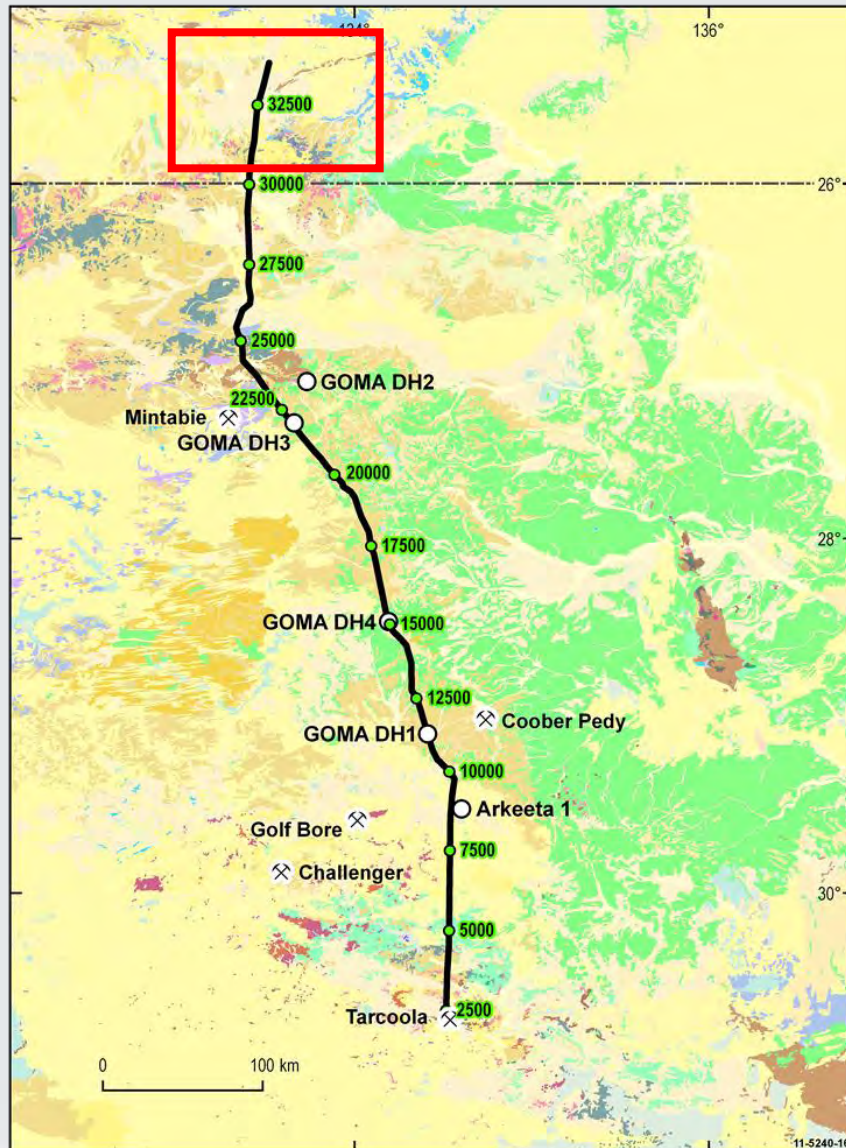
- | | |
|----------------------------|--------------------------|
| Base Cenozoic | Base Areyonga Formation |
| Base Brewer Conglomerate | Base Loves Creek Member |
| Base Mereenie Sandstone | Base Gillen Member |
| Base Pertaoorta Group | Base Heavitree Formation |
| Base Pertatataka Formation | Fault |

Amadeus Basin - North of Casey Inlier

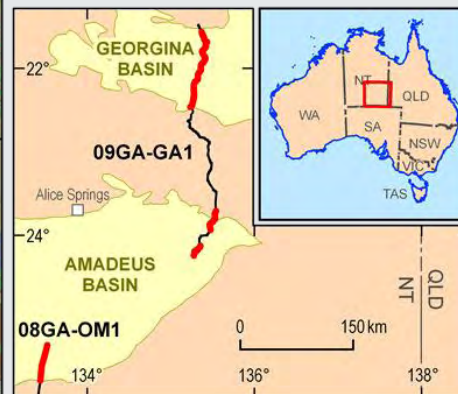
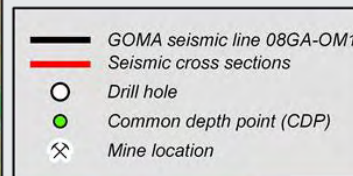
- Northeastern margin of basin
- Only Neoproterozoic succession preserved
- South-directed shortening
- Basement-cored nappe



GOMA Seismic Line (08GA-OM1)



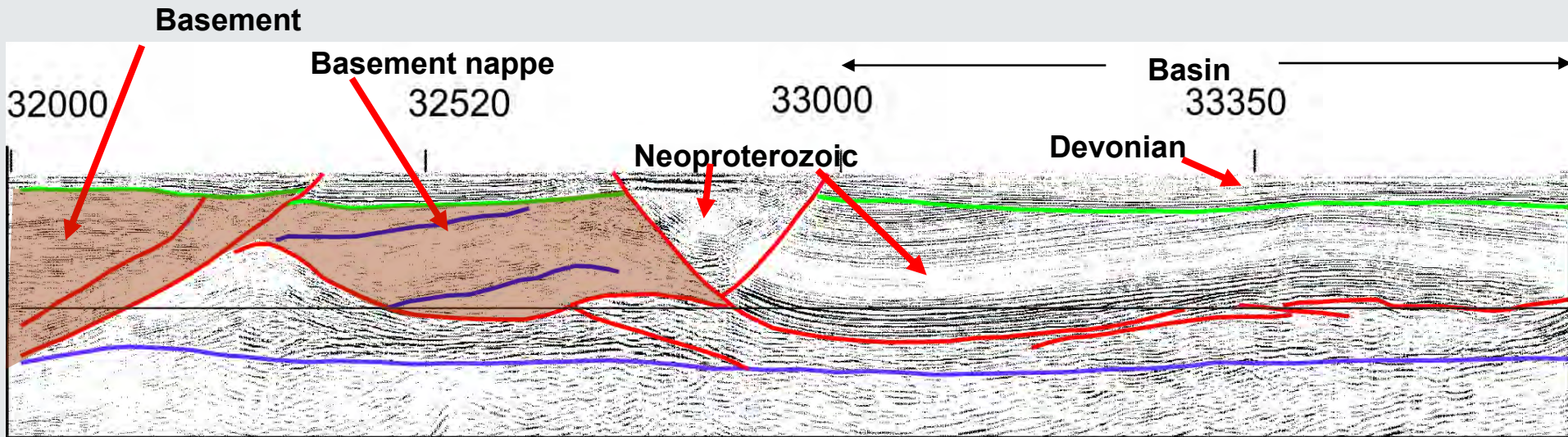
- Sparse basement outcrop
- Cenozoic and Mesozoic cover
- Geological control limited



Amadeus Basin – GOMA 08GA-OM1

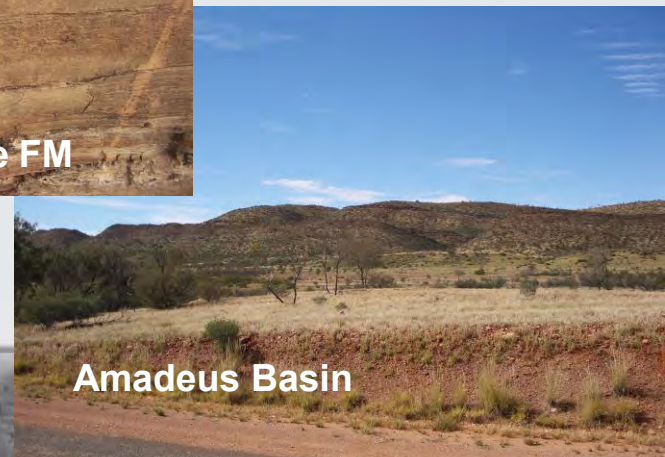
South

North

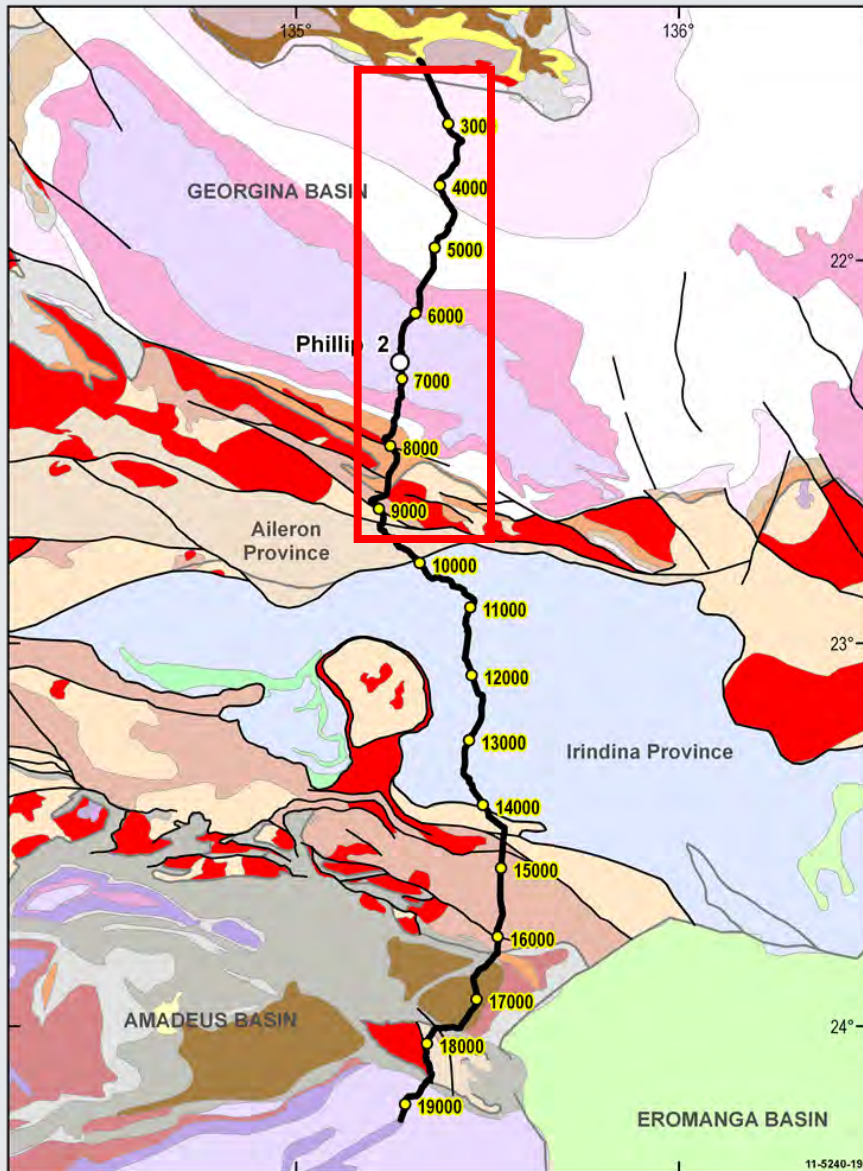


- Amadeus Basin - southern margin
- GOMA data available from GA web page –
Geoscience Australia Record 2010/39

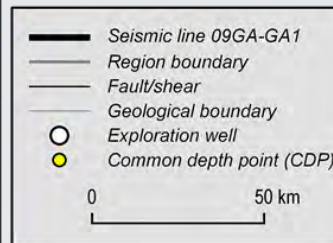
Amadeus Basin Photos



Georgina Basin



- Neoproterozoic to Devonian
- Poorly exposed in vicinity of seismic line
- Exploration from 1950s
- Phillip 2 well located near the deepest part of seismic section

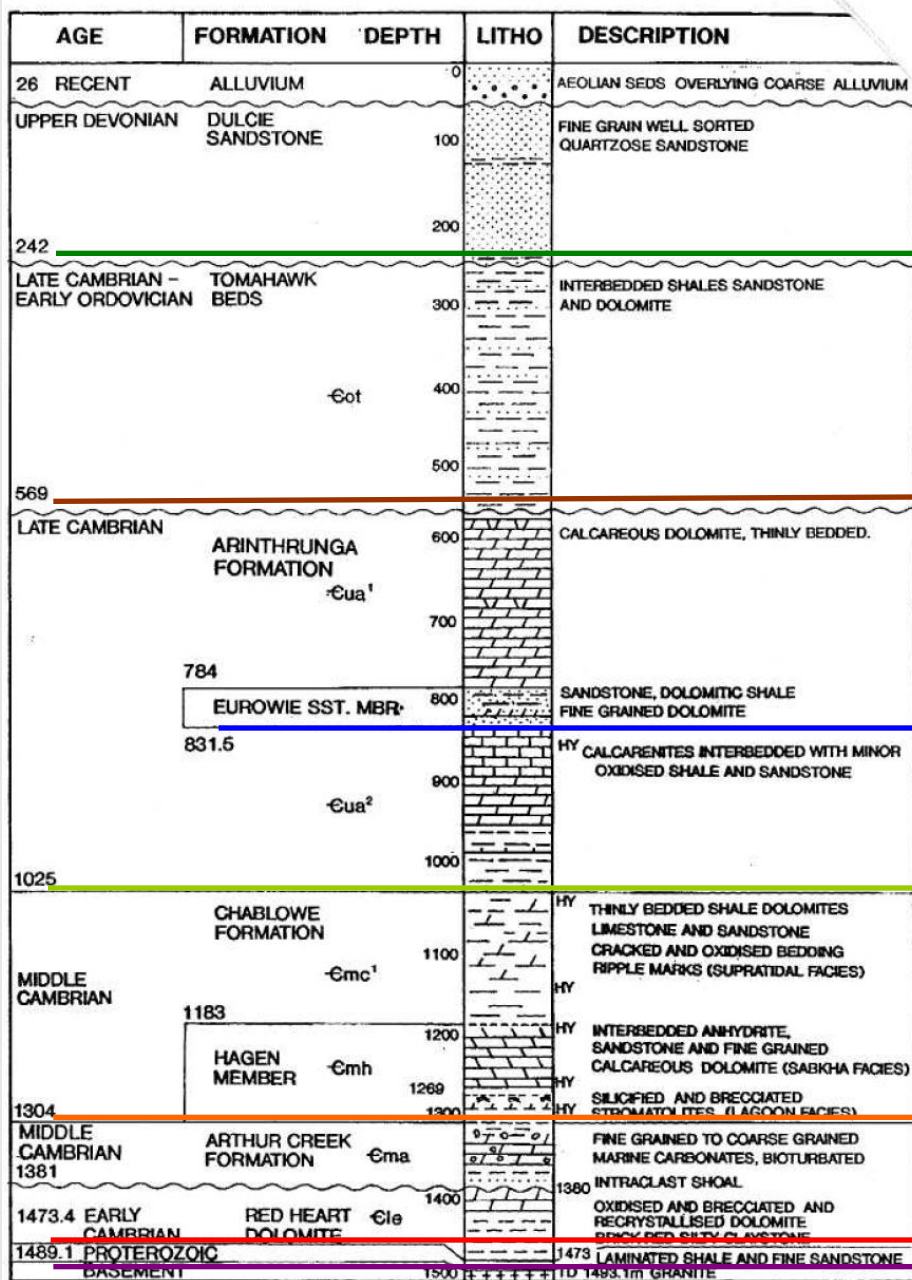


Georgina Basin - Stratigraphy

AGE	FORMATION	HC SHOWS
TERTIARY		
MESOZOIC	HOORAY	
MID DEVONIAN	DULCIE SS	
EARLY & MIDDLE ORDOVICIAN	TOMAHAWK	Gas show Bitumen
LATE CAMBRIAN	ARRINTHRUNGA EUROWIE SST Mbr	Bitumen
MIDDLE CAMBRIAN	HAGEN Mbr	Oil show
	ARTHUR CREEK FORMATION 'Hot Shale'	Oil show
	THORNTONIA LSST	Oil show
EARLY CAMBRIAN	RED HEART DOLOMITE	
	Mt BALDWIN Fm	
NEO-PROTEROZOIC	ELKERA	
	GRANT BLUFF	

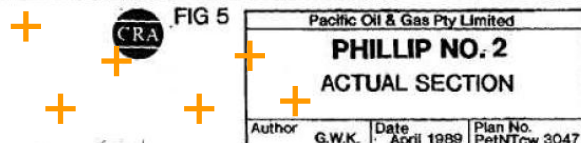
Several Cambrian Petroleum System

Source: Ambrose, 2002. The Georgina Basin, Northern Territory Australia. *Northern Territory Geological Survey, Record 2002-002.*



Phillip 2 Well

- Used to control stratigraphy
- 1489 m to basement (granite)
- 1802 ± 6 Ma (U-Pb zircon SHRIMP age, Kositcin et al., in prep.)

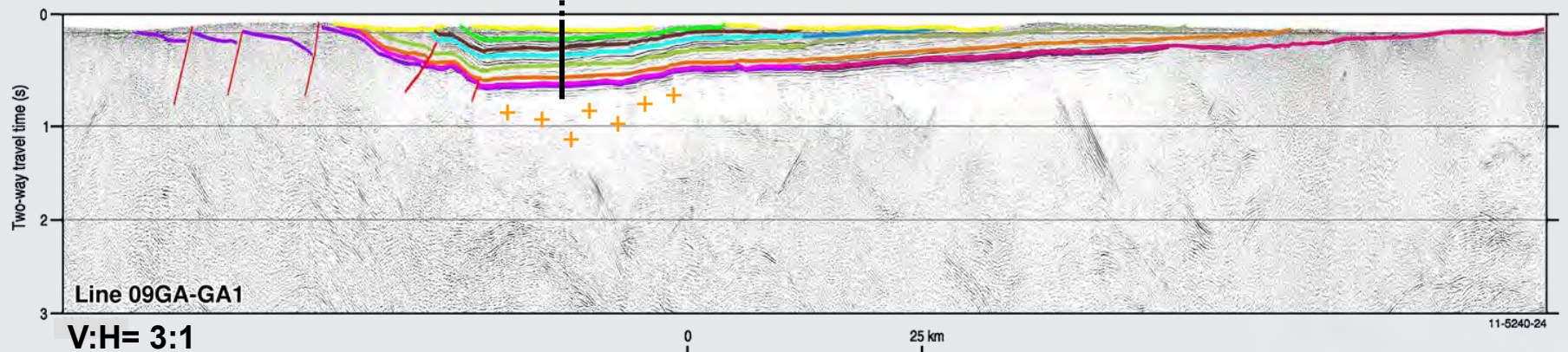
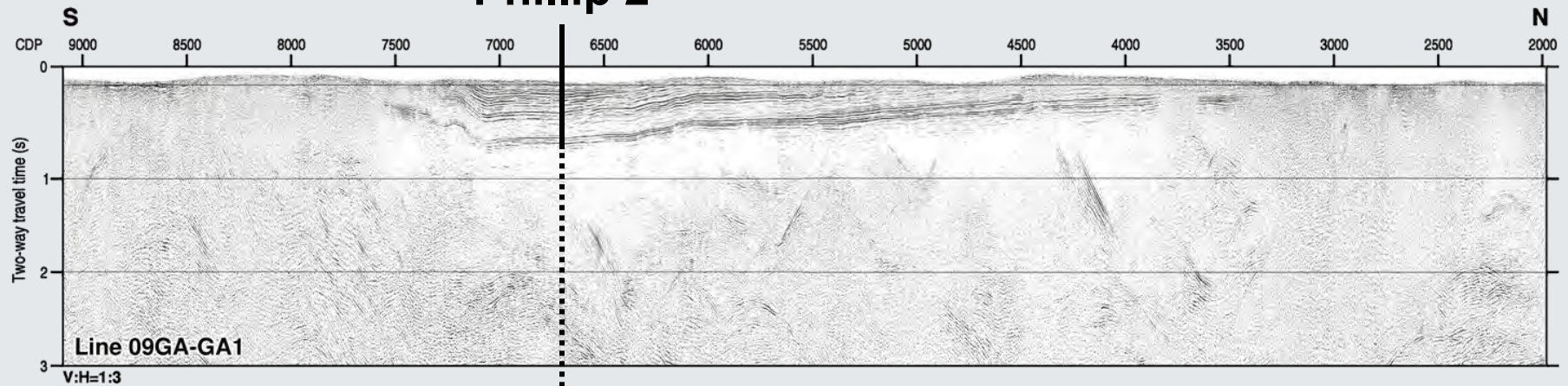


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2011

ALIA

Georgina Basin

Phillip 2



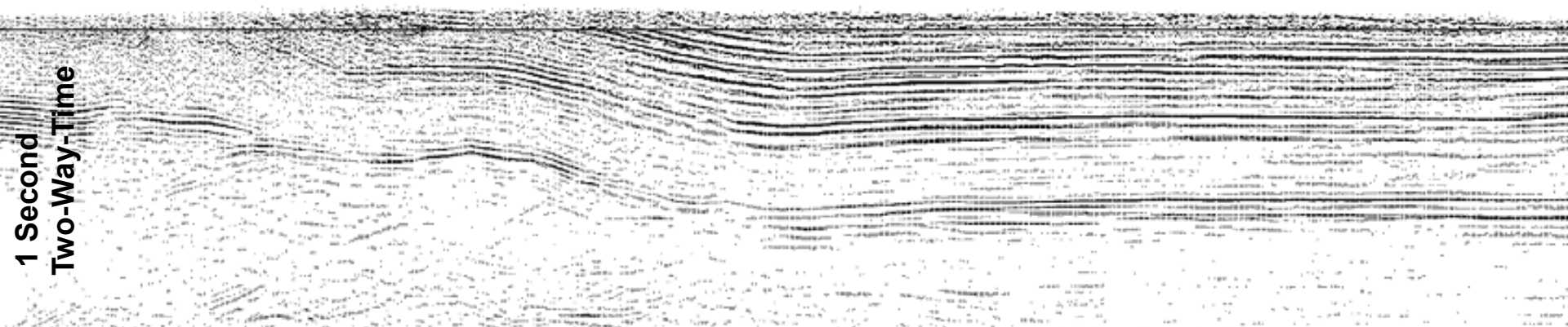
— Base Cenozoic
— Base Dulcie Sandstone
— Base Tomahawk Formation

— Base Eurowie Sandstone
— Base Arrinthrunga Formation
— Base Chaballowe Formation

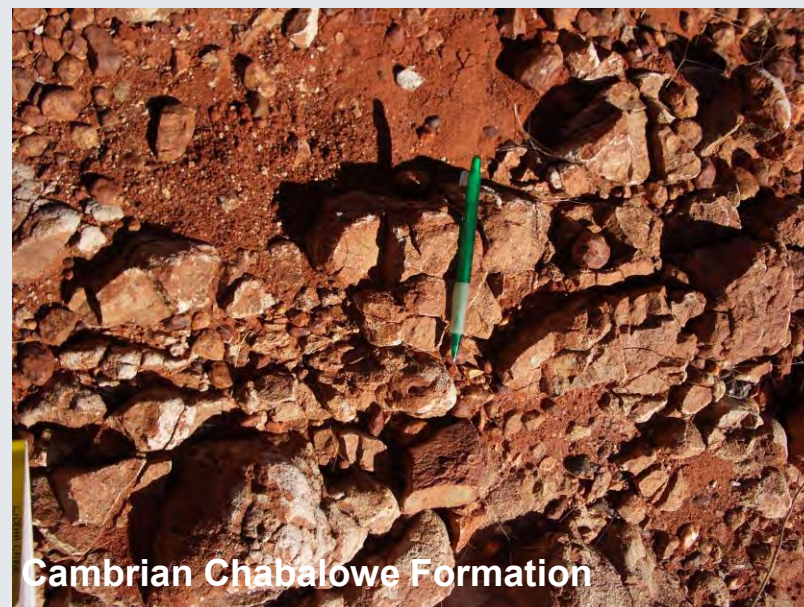
— Base Mount Baldwin Formation
— Base Neoproterozoic
— Fault

Georgina Basin – Dulcie Syncline

Phillip 2



Georgina Basin - Outcrop Photos



Conclusion

- Deep seismic reflection profiles across several frontier sedimentary basins, collected as part of the OESP, provide new information on basin architecture and internal geometries
- Geometries will form basis for ongoing work to assess the petroleum potential of these basins
- ***<http://www.ga.gov.au/energy>***

Thankyou

